an inharmonious jarring, or what he would call the phenomenon of spontaneous oscillation in a room.

Mr. Dircks explained the mechanical construction of Luntley's Shadowless Gas-burner as being admirably calculated to favour the chemical conditions requisite to promote the perfect combustion of coal-gas. He shewed that by bringing the atmospheric air, without being heated, to play directly on the inflamed gas immediately as it escaped from the numerous orifices of the burner, a larger quantity of the atmospherical oxygen was obtained in the same time and in equal measures of air, than if the same air had been previously heated; at the common temperature he observed that every cubic inch of gas would require 10 cubic inches of air for its entire combustion and consequent freedom from smoke, but that if heated to 480 degrees, every cubic inch of gas would reqnire 20 cubic inches of such heated air, because the absolute quantity of oxygen in either case remains the same, the bulk only being increased in the latter instance, and a mechanical obstacle interposed by such expansion. What he recommended was rather to heat the gas. He stated that inasmuch as less metal was used in the construction of the improved burner it communicated its heat with greater facility and rapidity to the gas, a condition highly favourable to the combustion of gas. The glass chimney, too, was of a shape that gave a more cylindrical form to the flame, being made of enlarged openings upwards. The flame was one of intense brightness, and of the colour and appearance of the flame produced by the combustion of the purest sperm oil. The intensity of the light he attributed to direct application of a more than usual quantity of the atmospherical oxygen just at the point where the gas was bursting into flame, and that therefore a less quantity of gas served to produce a light of equal intensity with that of the ordinary burner, while at the same time the diminished combustion was not only a source of economy to the consumer, but the products of combustion and hot air were considerably diminished, serving to keep the apartments of Club Houses, Concert Rooms, and other places using a great number of argand burners, much cooler than usual, the escaping hot air and carbonic acid being greatly diminished. Mr. Dircks warmly recommended the invention to more extended notice.

This paper led to some excellent remarks from Mr. Taylor on Mr. Farady's improvements in the ventilation of gas lamps and the lanterns of light-houses; Mr. Hawkins on increasing the draught of chimneys; and Dr. Scoresby on the improper construction of house chimneys.

(To be continued.)

THE SMOKE NUISANCE.

We find in the *Mining Journal* of Saturday last a continuation of the summary of evidence taken before the select committee of the House of Commons, on the smoke nuisance. It relates chiefly to the invention of Mr. C. W. Williams, for blending the atmospheric air with the gases generated in the furnace, and so producing perfect combustion; in other words, preventing the formation of smoke. Dr. Ure described the process thus:—

"The air passes through a great number of small apertures, and, by this means, it gets thoroughly intermixed before it loses the temperature of incandescence, and thus insures its perfect combustion. In furnaces a great deal of carbonic oxide is formed, which also thus gets its additional dose of oxygen. The air passing up through the bars is for the combustion of the coke, while the air passing through the chamber and its numerous apertures is for the combustion of the gases; the carbonic oxide formed, being also burnt, escapes as carbonic acid. By this means the whole of the fuel is entirely burnt—only half the heat is given out when the carbonic oxide is formed. When the fireman sees any smoke, he admits the air. The furnace bars should be covered, and no holes left in the fuel; after a little time, in every furnace, the fuel burns into holes, and by which means the air passes up through them, carbonic oxide is formed, and this requires its portion of air also. To know what heat is produced, Mr. H. Houldsworth, of Manchester (whom the Doctor described as his old pupil), has contrived a very ingenious pyrometer, which consists of a long wire, acting on a bent lever; the long leg of which traverses along a graduated arc—thus the workman sees the degree of heat in the furnace. The first process in the furnace is coking, and during that process, much gaseous matter is given off, which, in the ordinary plan, cannot be consumed; and as the hydrogen of the gas gives off three times more heat than the carbon or coke, this produces a great loss, if not burnt. If you burn a pound of carbon, you get only one-third of the heat you get from a pound of hydrogen; so that in hydrogenous or bituminous coals—as Newcastle coals—the hydrogen gives three times more heat than the carbon. It is the bituminous coal which produces the greatest nuisance from smoke, and which has not hitherto been rightly viewed. Formerly (the Doctor said) he attached much importance to the mode of feeding the fires gradually, as by Brunton's furnace, which he described. With Mr. Williams's furnace, as you can shut off the air, and reduce it to the plan of a common furnace, you can institute the most accurate experiments. It is found that by opening the hole and admitting the air, the smoke disappears, and the evaporation increases in the ratio of 10 to 8—so that, with the same fuel, you evaporate 10 lbs. of water, and but 8 lbs. only when the aperture is closed. With respect to heating the air (the Doctor continued), it would not be any improvement; and he stated, decidedly, that a simple plan may be adopted, that would not only prevent smoke, but likewise save fuel. With respect to durability, the Doctor further observed, that the perforated plates stand admirably for years, and without any trouble—the fact is, they are kept cool, and not exposed to any great heat. To a question respecting Mr. Watt's principle, of not putting the coal on to the fire, by means of a hopper, until it was coked, Dr. Ure observed, that that produced a great evil, as the carbonic acid formed in the front part became carbonic oxide in the other. Mr. Watt thought that, in preventing smoke, he had accomplished the sole object; by more minute investigation, however, it is now found, that what is called the destruction of smoke, in many cases, is merely the production of carbonic oxide, the destruction of the fuel, and the pollution of the atmosphere. With respect to Mr. Williams's plan, which is a simple and effectual one, the Doctor stated that he understood that he will meet Parliament more than half-way, and not allow his patent to be any obstacle to the universal adoption of his principle. The plan has been adopted in many furnaces, and Mr. Houldsworth (of Manchester), who has adopted it, has given a very favourable report of it. I have known many patents, but there is none in which that blending of the gases with the atmospherical oxygen admitted from many orifices has been so well effected. In conclusion, the chairman observed: To come back to the first position, your decided opinion is this, that the means of preventing smoke from fires and furnaces are feasible?—A. Yes.—Q. And that it would be eligible for manufacturers to be obliged to adopt them? A. That is quite my opinion."

The next witness was Mr. John Chanter. It will be observed that he supports the principle on which Mr. Williams acts, though his arrangement is totally different.

"He was of opinion that smoke can be consumed with considerable advantages to the manufacturer. He had taken out a patent for the improvement of Whitty's patent, and had joined some engineers at Liverpool, and taken out other patents. Some years ago he had hundreds of engineers attending where he had a furnace, and every one saw that there was no smoke whatever from it. He had put up 1,000 furnaces. At first several failed, but now he did not know of one doing so. He had guaranteed a saving of 10 per cent. upon steam-engine boilers, and 20 per cent. on the fires of dyeing-pans. He then described his plan. Since the meeting at Leeds, he had bought two additional patents, and made a combination with his own. The present patent which he submitted to the committee is not the same as was proposed to the Leeds committee. The principle of his patent was much like Mr. Williams's, but with a totally different arrangement. He thinks smoke, after it is once formed, cannot be burnt. His plan is a union of several different plans, twelve in number. He applies his plan by double fire-grates, which are under the whole of the boiler; one is under, a little inside, and he keeps up a heavy coke fire. He recommended paying the stokers in the manufacturing districts 1s. a-day extra, and that little difficulty would then occur in doing away with the nuisance. The majority of the firemen are of the lowest grades, but by paying them better the nuisance would be got rid of."

This last remark is significant. "Wrong never comes right" was the favourite maxim of Theodore Hook. Here we see it exemplified. The injustice of paying a friendless class of men inadequate wages, has been visited by a more than equivalent expenditure on experiments to abate a nuisance resulting from the apathy and sluggishness which low wages naturally engender; nay, further, by the injury to the general health of the community which the nuisance inflicts.

The next witness speaks favourably of the invention of Mr. Williams:—

"Mr. Henry Dircks was particularly acquainted with the argand furnaces of Mr. C. W. Williams, was practically acquainted with the mechanical details, and was also well acquainted with chemistry, and its connection with combustion. Had erected above 200 furnaces on Mr. Williams's plan within the last eighteen months, and it had since been applied to many steam-vessels. The expense was about from 3*l.* to 5*l.* for each furnace. The saving he found to vary from 10 to 30 per cent.; this arose from the various qualities of the coal, some producing more gaseous matter than others, and, of course, more economy by their combustion. Besides, some furnaces are already carefully managed on the common plan, and, of course, there is less room for improvement, and, therefore, there cannot be as great a saving. Still there is always a saving by effecting the burning of the gases. As to preference of plans, there is none which effects the same perfection as to the mixing of the gas and air; and, of course, so complete a combustion of those gases. On being asked to describe the chemical principles of this argand furnace, Mr. Dircks said, the principle is that gas emanating from coal requires much atmospheric air. There is no novelty in the principle of admitting air, but the novelty is in the mode of applying that principle—viz., in dividing the air by a great many apertures or jets. Every measure of gas requires ten measures of air; but if you admit the proper quantity in a body, or in bulk, it overpowers the gas, and cools it; it is like pouring oil on the wick of a lamp.—Q. The secret then is to admit just sufficient supply of air to create combustion?—A. Yes, and to get it mixed immediately. It would mix in the furnace, but the loss of time would cool the furnace; the jets, or divisions, make the mixture immediately. With respect to apportioning the quantity of air required, Mr. Dircks observed, that the orifice for its admission being adjusted, no more adjustment is required than for the argand lamp. When you ascertain, by observing the chimney, that a given quantity will produce a bright flame in the flues, and the chimney free from smoke, then you have a safe gauge, and are not admitting too much. By an experiment, the valve was kept open the whole day, and by a meter attached to it, the air had to pass through the meter, and the quantity was ascertained. On each charge being put on the furnace, an increased rapidity was given to the meter, shewing an increased quantity of air admitted; but as the quantity of gas diminished, the admission of air diminished also, as indicated by the meter; the natural demand for the air thus adjusting itself."

(To be continued.)

The Motion of Vessels caused by Waves Applied as a Motive Power.—A power which has long been vaguely known to exist, but the idea of ever bringing it into use never appears to have been even thought of, is just now being brought under notice by Y. A. Etzler, Esq., who, by means of some very simple machinery, has made the alternating perpendicular motion of a ship, by the power of the waves, subservient to her horizontal motion through the water. To conceive how this power can be brought into action, it is necessary to know, that to whatever height a wave rises, it has no effect on the calm of the water below, further than at a depth equal to its height, and hence it is easy to render the power of waves efficient, by offering them a resistance; for the propulsion of a vessel, this resistance is obtained by connecting a sort of platform placed *beneath* the undulation of the waves, with the vessel floating *on* them; at both ends of this platform, and brought up on each side of the vessel, are strong connecting rods, attached to arms working on an axis; to these arms are fixed ratchet rods, working in tooth wheels, connected with the paddles, and at every pitch of the vessel the alternate perpendicular motion causes the paddle-wheels to revolve. This is the most simple application of the power, but by a proper arrangement of requisite machinery, fly-wheel, &c., the motion of the vessel may be regulated as true as by the steam-engine, and by springs placed in proper parts of the two floating bodies—viz., the vessel and the platform—all danger may be resisted, and concussion rendered harmless. Mr. Etzler calculates that 20 to 30 miles per hour can be easily and safely attained by these means, and that, taking into consideration the duration of calms, when there is always an undulation of the sea, the average rate of velocity on long sea voyages may be estimated at from 10 to 20 miles an hour. A perfectly successful experiment has been made off Margate, with the most simple mechanism, and a model is exhibited in the captains'-room at Lloyd's for public inspection.—*Mining Journal.*